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ABSTRACT

This self-paced student training module on hygiene safety is one of a number of modules developed for Pre-apprenticeship Phase 1 Training. Purpose of the module is to familiarize students with the different types of airborne contaminants--including noise--which may be health hazards and with the proper hygienic measures for dealing with them. The module may contain some or all of the following: a cover sheet listing module title, goal, and performance indicator; study guide/checklist with directions for module completion; introduction; information sheets providing information and graphics covering the module topic(s); self-assessment; self-assessment answers; post assessment; and post-assessment answers. (YLB)

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INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP
PHASE 1 TRAINING

OCCUPATIONAL SAFETY
HYGIENE SAFETY

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Goal:

The student will become familiar with the different types of airborne contaminants--including noise--which may be health hazards, and with the proper hygienic measures for dealing with them.

Performance Indicators:

The student will demonstrate an understanding of the subject by successfully completing Self and Post Assessment exams at the end of this module.

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Study Guide

For successful completion of this module:

1. Familiarize yourself with the objectives on the cover sheet of this module.

2. Study the Information section.

3. Take the Self Assessment.

4. Take the Post Assessment.

Information

An industrial hygienist is a person who has been trained in recognizing, evaluating, and controlling environmental factors. The hygienists concern themselves with the chemical, physical, biological, or stress factors that may cause illness, impaired health, or significant physical discomfort to employees.

Health hazards frequently result in employee over-exposure to toxic materials. There are many toxic materials, some of which you are probably quite familiar with, such as chlorine gas or carbon monoxide.

When an employee becomes over-exposed to toxic materials, his or her health can be affected either internally (vital internal organs) or externally (skin, sense organs). Therefore health hazards result from both INTERNAL and EXTERNAL exposure to toxic materials.

INTERNAL EXPOSURE results in damage to internal organs from harmful or toxic materials entering the body in three ways.

1. By breathing contaminants into the respiratory tract or lungs, such as dust, fumes, vapors, mists, or gases.
2. By swallowing contaminants with saliva, water, or food into the digestive tract.
3. By absorption through the skin.

Many substances, such as TNT, leaded gasoline and hydrogen cyanide can produce internal poisoning by direct contact with the skin. If there are wounds such as open cuts, scratches, or breaks in the skin, absorption is still easier.

The other type of health hazard, EXTERNAL EXPOSURE, can be defined as a contact with the skin or sense organs by harmful elements, or simply too much contact with an ordinarily harmless element. Effects of external exposure can vary quite widely --from skin rashes to severe burns. Even noise can be considered an external health

hazard.

NOISE

Exposure to noise affects one of our senses; the sense of hearing. There are five senses: sight, hearing, smell, taste, and touch. Any one of these senses can be affected by external over-exposure to toxic materials, or physical agents.

Until three decades ago, the effect of noise hazards on workers was not regarded as significant by some employers. As more information was gathered, it became evident that many employees were suffering from acute hearing losses due to the noise levels in their work area. To effectively combat the problems of excess noise in your work area, you should understand some of the basic concepts of sound and noise levels.

The noise level of any operation is measured in terms of DECIBELS (dB). A decibel is the measurement of the intensity of a sound. Different sounds have different decibel levels. For example, the intensity of a soft whisper is about 30 dB, normal speech is about 73 dB, and a jet airplane gives off an intensity level of about 160 dB. If you have ever been near a jet airplane when the engines were on, you will probably remember how loud and possibly painful the noise was.

One important point to remember, with regard to sound, is that a hearing loss usually occurs only after a worker has been exposed to a noise level over a period of time. For example, we listed the intensity level of a jet airplane as 160 dB. If you were at an airport and were near the airplane for a short time, you wouldn't experience a permanent hearing loss. But if you had to work near airplanes all day, and didn't wear ear protection, you would eventually experience a hearing loss.

Following is a list of exposure levels a worker can tolerate for a certain number of hours per day over a long period of time.

Maximum Hours of Exposure Per Day	Sound Level Measured in dBA
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/2 or less	115

As you have probably noticed in the sound exposure levels, the notation dBA is used. We have already explained what decibel (dB) means. The "A" stands for a scale on a sound level meter, which approximates the range of a person's hearing. Whenever a qualified person measures the noice level in your work area, he or she will use a sound meter.

If excessive noise exists, temporary measures, such as ear plugs or ear muffs, should be instituted immediately, while steps for a permanent solution are being taken. Industrial hygienists or safety and health specialists can help to recommend the best course of action.

Not only does noise affect the ability to hear, it also affects the body itself. Noise can cause changes in the size of blood vessels, restricting the flow of blood, making the heart work faster. Noise also affects the brain, causing blood vessels to enlarge and produce headaches. Other body organs, such as the kidneys, also are affected by noise.

Excessive noise affects the rest of your body and therefore can also be an internal exposure.

Noise can also stimulate an individual to a nervous peak. Momentary lapses of efficiency result which lead to errors in judgment. This may be reflected in a reduced quality of work and an increased number of accidents.

There are many permanently harmful consequences for employees who are over-exposed to toxic materials. The following table indicates the results of over-exposure to some specific toxic materials or hazardous physical agents.

Sense Organ	Exposure to:	Effect of Extreme Overexposure
Eyes (Sight)	Butyl Alcohol	Loss of Sight
Ears (Sound)	Excessive Noise Levels	Loss of Hearing
Nose (Smell)	Acetic Anhydride	Loss of Sense of Smell
Mouth (Taste)	Chromium	Loss of Sense of Taste
Skin (Touch)	Phenol	Extreme Dermatitis

External exposure to certain chemicals removes the skin's protective oils and makes it more susceptible to injury. An example of a chemical that will do this is acetone.

There are many ways that materials and chemicals can affect the body. The first specific type we will talk about is called exposure to AIRBORNE CONTAMINANTS. They are measured in Threshold Limit Values (TLV). TLV refers to airborne concentrations of substances, and represents limits under which nearly all employees may be exposed without adverse effects. Threshold limit values are stated in terms of time weighted concentrations for an 8-hour workday and 40=hour workweek.

Following is a brief description of each of the categories of airborne contaminants which can be commonly found at work sites.

DUSTS are airborne particles generated mechanically from operations such as drilling, cutting, blasting, crushing, and grinding. Dust particles are measured in microns (microns are about 1/25,000 of an inch in size). Most dust averages between 1/2 to 3/4 of a micron. Dust particles therefore can not be seen by the human eye. They can affect a person's skin, eyes and lungs.

Another airborne contaminant is FUME. Fumes are solid particles that are produced by condensation of vapor usually accompanied by chemical changes. Examples are welding, burning, and decomposition by heat. The most common fumes are caused by the oxidation of a metal. Fumes are usually smaller than dust and range generally below 1 micron; they cannot be seen by the naked eye either.

Another airborne contaminant is MIST. Mists are particles of liquids or mixtures of liquids and solids. The size of a mist depends upon the process by which it is made. An example is the chromium plating process.

Another airborne contaminant is GAS. Gas is a low density material that can expand and contract when it comes into contact with different ranges of temperature and pressure. A gas can be changed to a liquid or solid by proper changes of both temperature and pressure.

An example of this type of airborne contaminant would be a gasoline engine propelled forklift that puts out carbon monoxide in the form of a poisonous gas. Employees should take extreme care when they operate a gasoline propelled vehicle in a

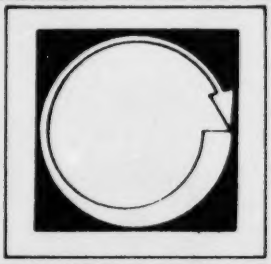
closed space.

The last airborne contaminant we will discuss is called VAPOR. Vapors are gaseous forms that normally are in the solid or liquid state at room temperature. Most vapors can be changed back to a solid or liquid state by increasing the pressure OR decreasing the temperature. This differentiates vapors from gases since gases change to a solid or liquid by changing both temperature AND pressure.

Most hazardous materials can be classified by the way they affect the body. Airborne contaminants, in addition to those already mentioned, may include the following: 1) IRRITANT materials that attack the lungs, 2) ASPHYXIANT materials that combine with the blood to prevent the normal transfer of oxygen to the tissues, 3) ANESTHETIC and NARCOTIC materials that cause sleepiness and nausea, 4) SYSTEMIC poisons that attack the vital organs of the body such as the liver and kidneys.

Short of covering your entire body and breathing from a self-contained unit, there is virtually no way to protect yourself from the many gases, fumes, etc. which are found at many work sites. Fortunately, the body can accept many of them for short periods with little negative effect. Ventilation is the most effective way to deal with most of them, circulating air which replinishes contaminated air with fresh air. Gloves, proper clothing and face shields may be necessary in some instances. Respirators, or other artificial breathing devices, should be used only as a last resort.

Self Assessment



From the four possible answers below each statement, select the one that correctly completes the statement. Place the letter for that answer in the blank to the left of the statement.

1. ____ How many hours per day could employees work in an area that was measured to be 100 dBA?
   a. one hour
   b. two hours
   c. three hours
   d. four hours

2. ____ If vapor, mist, gas, fumes, or dust in your work area irritates your EYES, the effect would be called an _____ exposure.
   a. internal
   b. illegal
   c. external
   d. isotonic

3. ____ A material that causes a worker to pass out because of lack of oxygen would be:
   a. irritant
   b. asphyxiant
   c. external
   d. systemic

4. ____ What would the effect of dust on an employee be called?
   a. negligible
   b. internal exposure
   c. external exposure
   d. both b and c

5. ____ Noise may cause:
   a. temporary loss of vision
   b. temporary loss of hearing
   c. both a and b
   d. loss of hearing, stress, loss of concentration

6. ____ Noise has been regarded as a health and safety hazard for:
   a. about 300 years
   b. about 30 years
   c. about 3 years
   d. about 3,000 years

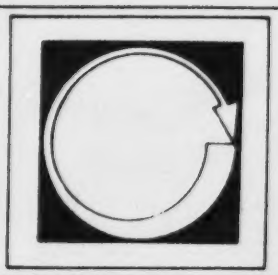
7. ____ Which of the following is clearly an example of internal exposure?
   a. breathing contaminants
   b. swallowing contaminants
   c. absorbing contaminants
   d. all of the above

8. ____ An industrial hygienist is a person who can recognize, evaluate, and control:
   a. decibels
   b. chlorine gas
   c. environmental factors
   d. intangible factors

Self Assessment Answers

1. b
2. c
3. b
4. d
5. d
6. b
7. d
8. c

Post Assessment



Select the answer which best completes each statement. Write the letter for that answer in the blank to the left of the statement.

1. ____ Noise can affect:
   a. the ability to hear
   b. the body itself
   c. both of the above
   d. airborne contaminants

2. ____ Which of the following is an example of a vapor?
   a. the smell of soup heating on a stove
   b. a small particle of liquid from the air in a chrome plating factory
   c. a TLV
   d. those small particles in the air after blasting a hillside

3. ____ Which of the following is not an airborne contaminant?
   a. gas
   b. sunlight
   c. dust
   d. fume

4. ____ A material which affects the heart is called:
   a. an irritant
   b. an asphyxiant
   c. a narcotic
   d. a systemic poison

5. ____ The best way to protect yourself from airborne contaminants is:
   a. wear a cotton hood
   b. ventilate the area
   c. wear a pressurized suit
   d. wear gloves and a shield

6. ____ The main difference between dusts and mists is:
   a. one can kill you and the other can't
   b. the size
   c. no difference
   d. one may be a particle comprised of liquids

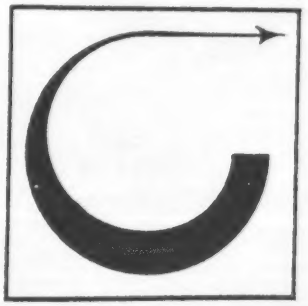
7. ____ Exposure to toxic materials can result in:
   a. internal damage
   b. internal or external damage
   c. internal and external damage
   d. external damage

8. ____ Swallowing contaminated material is an example of:
   a. internal exposure
   b. stomach cramps
   c. external exposure
   d. both internal and external exposure

9. ____ TLV refers to:
   a. thematic limit values
   b. concentrations of substances and the time which the body can withstand them
   c. only airborne particles of dust, mist or vapor
   d. none of the above

10. ____ If your skin absorbs a toxic material like gasoline, you run the risk of:
   a. internal injuries
   b. toxic hydrosis
   c. industrial hygiene
   d. loss of hearing

Instructor Post Assessment Answers



1. c
2. a
3. b
4. d
5. c
6. d
7. c
8. a
9. b
10. a